

Land Plants, recently discovered in the Silurian Rocks of the United States.

BY LEO LESQUEREUX.

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The first remains of land plants known from the lower Silurian, were found some years ago by Dr. S. S. Scoville in blue, hard, sandy clay, or marly shale, of the Cincinnati group, on Longstreet Creek, six miles east of Lebanon, Ohio.

This discovery, an important one for the Natural History of this country, was recorded in the Am. Journ. of Sciences and Arts, Jan. 1874, p. 31, and the remains, representing two fragments of stems or branches, were briefly described at the same time. Their reference to the botanical group of the *Sigillariæ*, was then hypothetically admitted, from the likeness of the scars of the surface of one of the fragments to species of this genus: *S. Brardei*, *S. Menardi*, etc.

Later, Prof. Newberry, to whom the same specimens were communicated also, gave an account of them with figures in the same Journal, Aug. 1874, p. 110, considering them, in the conclusion of his remarks, as casts of some large *Fucoids* or marine plants. As the doubt could not be cleared up by mere discussion, the subject was dropped, in the hope that the discovery of other materials of the same kind might afford more light upon the true character of these vegetable remains.

In the meanwhile, as the specimens of Dr. Scoville had been returned to me, I made a new and more attentive study of them, had them carefully figured, and the characters given in the original description being recognized as exact, all the documents, specimens and drawings were, at the request of Prof. J. D. Dana, sent to him for examination, and also referred by himself to Profs. D. C. Eaton and A. E. Verrill of New Haven. These celebrated Naturalists, the more competent judges on the subject, recognized the fragments as positively referable to land plants by their characters.

Other specimens still more evidently representative remains of land vegetation were soon after communicated from the Silurian of Cincinnati, and also from the lower Helderberg Sandstone of Michigan; and as still more of the same kind had been promised, the publication of the descriptions was postponed, in order to have, for indisputable evidence, a sufficient number of these vegetable fragments, from which also the relative characters of this new flora might be discerned.

Just now a branch of a fern has been obtained from the Silurian Schists or Slates of Angers, France, and the fact is reported to the Academy of Science of Paris, by Count Saporta, with the remark, that this important discovery was forestalled in America, where remains of Silurian Land Plants had been found whose description would be greatly desirable at the present time.

We have thus a sufficient reason for the publication of the following documents relative to the subject.

DESCRIPTION OF SPECIES.

Genus PSILOPHYTUM, Daws.

Quat. Journ. of the Geol. Soc. of London, p. 478.

"Lycopodiaceous plants, branching dichotomously and covered with interrupted ridges or closely appressed minute leaves; the stems, springing from a rhizome, having circular areoles sending forth cylindrical rootlets. Internal structure, an axis of scalariform vessels, surrounded by a cylinder of parenchymatose cells and by an outer cortical cylinder of elongated woody cells (prosenchyma). Fructification probably in lateral masses protected by leafy bracts."

The species which I have to describe here differs by these points only from the generic description: the stems of one of them has not any interrupted ridges or striæ of any kind; both are without leaves. But in the species described by the author the leaves are either rudimentary or, more generally, the stems are naked, either in their original growth or by denudation, caused by maceration or other physical circumstances. For example, *Psilophytum elegans* and *P. glabrum* have no leaves; *P. robustius*, judging from figure 121 in Dawson's *Pre-carboniferous plants of the Geological Survey of Canada*, bears leaves at the extremity of the branches only, and the stems appear smooth as they are also in *P. glabrum*.

PSILOPHYTUM GRACILLIMUM, sp. nov.

Pl. I, fig. 2.

Stem very slender, dichotomously branching, smooth or naked half round, slightly channeled in the length; branches numerous, of various length, filiform.

The stem is scarcely one millimeter thick at the base; the upper branches, curved as from a spiral unfolding, are slender, gradually attenuated and capilliform, or of the thickness of thin thread at their extremities.

The plant embedded in hardened, blue, shaly clay or marl, is transformed into coal, part of the branches broken and displaced having left their prints as half cylindrical concave moulds. This character, as also the depression in the middle and along the whole axis, proves the woody or vascular texture of the plants and of course separates them from the *Fucoids*.

Comparing this specimen with species published by Prof. Dawson from the Devonian measures of Canada, its relation to *P. elegans*, Quat. Journ. Geol. Soc., Nov. 1862, p. 315 Pl. xiv, fig 29, 30, is recognized as quite close. But the affinity of the characters is still more marked with a plant of *Psilophytum* as restored in its original state for exemplification of the genus in the Proceedings of the same Journal, Jan. 1859, p. 479, fig. i. If this figure, whose stem is without leaves, was the exact representative of a peculiar species I should have considered our silurian form as identical with that of Canada.

The specimen from Cincinnati, a piece of shale, one or two centimeters thick, has on the reverse fragmentary remains of the same plant, especially some upper branchlets like fig. 2*a*, more evidently hooked than those of the main stem. Both the upper and lower surface of the shale are smooth, have no animal remains; but the intermediate layers hold small molluscan species characteristic of the Cincinnati Group.

Habitat. Near Covington, opposite Cincinnati, in the bed of the Licking River. Found by Mr. Ed. Ulrich; communicated by Rev. H. Herzer.

PSILOPHYTUM CORNUTUM, sp. nov.

Pl. I, fig. 1.

Stem thick, dichotomous; divisions variable in distance, the terminal ones short, pointed, nearly equal in size and length; surface slightly rugose and irregularly striate.

The branches in the lower part are thick comparatively to their length, three to four millimetres, irregularly striate when decorticated, or merely punctate upon the thin bark, with small projecting dots resembling the basilar remains of scales or small decayed leaves; lateral branches short, narrowed to a sharp point; the upper or terminal ones about equal in length, appearing like a pair of small pointed horns.

The species is comparable only to some of the fragments not specified but figured by Prof. J. W. Dawson (Geol. Survey of Canada, Fossil Plants of the Devonian and Upper Silurian formations, figs. 243, 244). The author remarks, "that these fragments are probably originating in the Upper Silurian of Gaspé; that as they are found in the lower part of the Limestone which underlies the Devonian Gaspé Sandstone and become more abundant in the upper beds, this suffices to indicate the existence of neighboring land, probably composed of the Silurian rocks, and supporting vegetation."

From the preservation of its branches even to the smallest subdivisions, the specimens here represent part of a plant embedded in the place of its growth. The matrix is a piece of very hard calcareous shale, seven to eight millimetres thick, bearing on one side irregular undulations like ripple marks, without any trace of organic remains, and on the other the fragments of plants as figured here. The branch in *a* represents a different species, and indeed a marine or rather a brackish plant, closely related to species of the present genus *Chorda*, Stack. This fragment seems to have been mixed in the tide pools with freshwater or land plants growing there. For, another thick specimen of the same locality, and compound, bears a profusion of marine mollusks, and has only branches of this as yet undescribed marine species: *Calamophycus septus*, whose character may as well be here fixed.*

* Genus CALAMOPHYCUS.

Same characters as the species.

CALAMOPHYCUS SEPTUS, sp. nov.

Fronds simple, cylindrical, elongated, gradually tapering to a point;

Habitat. Lower Helderberg Sandstone, Michigan. Discovered and communicated by Dr. Carl Rominger, State Geologist.

CALAMARIÆ.

ANNULARIA ? Brgt.

Stem articulate ; leaves verticillate, lingulate, gradually narrowing to the base, either pointed or rounded at the top ; midrib thick.

Our species differs from the generic characters by the absence of a midrib. The leaves, however, are very small, indistinct, their substance being amalgamated into that of the stone, and the nervation is nearly obsolete.

This vegetable form might be referable to *Sphenophyllum*, or even to some peculiar generic division. Its characters relate it positively to the sections of the Calamariæ, as far as it is fixed until now.

ANNULARIA ROMINGERI, sp. nov.

Pl. I, fig. 6.

Stems long and slender, articulate, smooth ; articulations at regular short distances, inflated, bearing oblique branches and leaves ; leaves small, lingulate, apparently flat, either truncate or rounded at the top ; nervation obsolete.

The inflated nodi and the flattened leaves, refer the plants to *Sphenophyllum*, while the obtuse, entire, numerous leaflets, disjointed to the base, relate it to *Annularia*. From both these genera it is removed by the smooth, not ribbed, nor striate stem, and by the oblique direction of the branches. By this last character it is allied to *Asterophyllites*. The articulations are numerous, five to eight millimeters distant ; the leaves scarcely three millimeters long. The direction of the branches, all in the same way and nearly parallel, shows that they were attached as branches to the same stem, and not displaced by water or by any kind of transportation. Like the fragments of fig. 1, they have been embedded at their place of original growth. This fact is rendered still more evident by the presence of small Serpulids (fig. 6c, enlarged *cc*), a considerable number of which are attached to the stems and strewed over the stone.

The specimen bears also (fig. 6b,) oval granulate protophytes : *Xanthidia* ? seen enlarged in *bb*.

Habitat. Same as the former species in the lower Helderberg sandstone formations of Michigan. The compounds of the specimens are still harder and more calcareous. Found like the former, and communicated by Dr. Carl Rominger.

cavity divided by transverse membranes, either passing through the whole diameter, or connected in the middle to vertical subdivisions.

The internal parietics, irregular in distance and thickness, are distinctly seen through the smooth epidermis, which, moreover, is often destroyed, the internal structure being thus clearly exposed. The cavity of the stem is inhabited by the same species of *Serpulid* as seen in fig. 6c.

SPHENOPHYLLUM, Brgt.

Stem articulate, leaves verticillate, cuneiform, crenulate, dentate, or lobed at the upper part which is truncate or rounded; midrib none; nerves straight, diverging fan like, simple at the base, dichotomously forking once or twice.

Here also, the vegetable fragments, which we refer, legitimately it seems, to this genus, differ in one point from the typical characters established from Carboniferous specimens. In these, the leaflet, generally four to six, are separated to the very base or free. In the Silurian plants, the whorls or leaflets, four or five, compose a single leaf, the divisions being lobes, cut indeed to near the point of attachment to the stem, where they are joined in obtuse sinuses. The character is distinctly seen upon the specimen fig. 4 and 5, enlarged in 4^a and 5^a. None of the authors describing this genus, since it was fixed by Brongniart, has remarked upon the connection of the leaflets at their base, though this connection is often represented by the figures given of species of *Sphenophyllum*, as for example, *S. oblongifolium*, Germ. and Kaulf. in Geinitz, Verst. v. Sachsen, pl. xx, fig. 12, where a whorl is represented with six leaflets free from the stem, whose place is marked by a circular round central scar, the leaflets being united at their base as by a ring. I must say also, that in the very numerous specimens of *Sphenophyllum* which I have had for examination, I have very often remarked this connection of the leaflets, but never, however, as distinct and as distant from the base as in the following species. In *S. Schlotheimii* and *S. oblongifolium*, the nerves are positively simple at the base, though two or more in the same leaflet. This character of course implies a connection of the border of the leaflets at or near the base, and in this case, they do not leave distinct impressions of their point of attachment to the stems. I therefore admit the Silurian plants as truly referable to this genus, the difference remarked in its characters being merely specific and apparently proper to a type not yet fully developed.

SPHENOPHYLLUM PRIMÆVUM, Lesqx.

Pl. I, figs. 3-5.

Stems or branches slender, articulations close, equidistant; leaves in whorls of four or five leaflets connected towards the base and joined by slightly obtuse sinuses; leaflets either truncate and crenulate at the top, or sometimes deeply split or lobate; nerves simple at the base, sparingly dichotomous, forking mostly once, even simple.

If we would not take into account the connection of the leaflets, the relation of this species to *S. Schlotheimii*, Brgt., and especially to *S. oblongifolium*, Germ., as figured by Geinitz (loc. cit.), would appear very close. The difference would be marked merely by the shorter leaflets or the smaller size of the plant and the less enlarged divisions. In the Carboniferous species, which is also frequently found in the American coal measures, the veins, simple at the base, and generally two for each leaflet, have also few divisions, forking only once or twice.

The specimen of fig. 3, have the stems distinct, slightly striate, even slightly inflated at the articulations, a character observable only with a strong glass. Fig. 4 has also the stem distinctly seen between the two whorls, and even fig. 5 has, dimly seen, a remnant of stem as represented upon the figure.

There is a difference in the size and the subdivision of the leaflets of fig. 3; but the woody matter of the plants softened by decomposition has penetrated the clay where the vegetable fragments are imbedded and the outlines of the leaflets are indistinct. On one of them only the nerves are perceivable. The identity of the species represented by fig. 3, with those of figs. 4 and 5, is not ascertainable, but they all evidently represent the same Genus.

There is in the Museum of Comparative Zoölogy of Cambridge a piece of true *granite* bearing remains of a fine branch of *Sphenophyllum*; three whorls of leaves, whose stem is destroyed by decomposition, but whose outline and nervation are perfectly and very distinctly preserved. The positions of the whorls is half quincuncial, two of them placed at the base and one between them at a distance above; the centres of the leaflets representing the three points of an equilateral triangle.

The leaves doubly larger than those of our fig. 5, measuring two centimeters in diameter, are divided into five lobes, distinct to a distance from the round central point of attachment to the stem; truncate and crenate at the top; with each three to five nerves; simple at the base and forking only once in the middle or near the point. The divisions of the border are irregular as in our figure, which it represents exactly in just double size.

We have been more than once discussing with Prof. Agassiz the origin of this remarkable vegetable fragment. Now that congeners are recognized in the Lower Silurian its presence upon granite is explainable, perhaps, as resulting from the casual deposit of a branch of *Sphenophyllum* thrown out into a basin of fresh water, upon granite rocks bordering swamps. Or possibly, the plant grown in place has been preserved by the drying and hardening of a film of decomposed vegetable matter, which seem to adhere to the surface of the granite. As the vegetation of the carboniferous is known by remains of materials heaped in place for a long period of time, and preserved into the compounds formed by deposits of the same age, the mode of preservation of this plant upon granite, is therefore different. Hence the reference to the Silurian of this branch of *Sphenophyllum* is merely authorized by the identity of its character with those of the species described from the Cincinnati group.

Habitat. Covington, opposite Cincinnati, specimen fig. 3, discovered by M. E. I. Ulrich. The fragments communicated by Rev. H. Herzer are in fine grained blue clay or marl, a compound like that where *Psilophytum gracillimum* is imbedded. Specimen fig. 4 was sent by Mr. Mickleborough, School Principal, and found by him in the corporate limits of Cincinnati, in a locality known as Limekiln Run, about three hundred and seventy feet above low water of the river. That of fig.

5 was communicated by Mr. C. B. Dyer. It is upon the surface of a stone exposed for a long time to atmospheric influence. All the specimens are from around Cincinnati, in connection with invertebrate animal fossils of the Cincinnati Group.

Plants of the same kind have been found many times already it seems ; for Professor Mickleborough informs me that another specimen discovered within the clay, somewhat obscure, and apparently like the one of our fig. 3, was washed and rubbed in order to expose the leaflets more distinctly, and in that way the leaves were nearly totally effaced. Another offered for sale was from description like that of fig. 5. Still others have been mentioned to me. They have been considered by some collectors as the work of insects ; by others as fucoidal or coralline productions, like *Oldhamia* ; and by others as specimens of the vegetation of the Carboniferous transported by drift. All these suppositions are contradicted by the fragments found imbedded in the clay or attached to pieces of hardened clay of the same compound as the Cincinnati blue marl, and still more by the described characters of these plants.

PROTOSTIGMA, Lesqx.

This Generic name is provisionally admitted for the description of fragments of stems whose relation to species of *Sigillaria* and other types of vegetables of the Devonian and the Carboniferous is surmised from the rhomboidal form of the scars or bolsters marked upon their bark. This form is very commonly seen upon plants of this kind. It characterizes in its multiple more or less definite transformations, the impressions of the outlines of the points of attachments of simple leaves to stems, branches or trunks of trees of the old formations. Therefore, it would not be surprising to find it already traced upon Silurian woody stems or branches. The reference of those original marks, as long as they are not defined by the vascular scars in the middle, is not possible. This is implied by the name under which the remains are described.

PROTOSTIGMA SIGILLARIOIDES, sp. nov.

Pl. I. fig. 7-8.

Branches or stems cylindrical, scarcely flattened by compression ; surface marked by rhomboidal cicatrices, enlarged on the sides, contiguous and in spiral order, with indistinct impressions of oval vascular scars in the middle.

I refer to this specific form three specimens, two of which are figured here. The fragment of branch, fig. 7, is represented in its natural size. It is slightly obliquely compressed, and thus, the lateral bolsters are somewhat disfigured on the two sides, and displaced from their normal position. But on the face as seen in fig. 7 and 7 a, the scars are preserved in their original arrangement. Even the central vascular points are distinctly seen in the middle of some of the bolsters, though the whole impression is of course somewhat obliterated by erosion of the mould, or by decomposition

of the vegetable fragments embedded into the clay. Another specimen not figured is larger, seven centimeters in diameter, nine centimeters long, nearly exactly cylindrical, with irregular more or less distinct ribs, marked crosswise by large wrinkles or irregular protuberances, which do not show any distinct relation of form and position between them. Therefore, both these fragments are identified merely by their cylindrical shape, representing stems or branches, and by their common habitat. The compound of both is exactly of the same matter, a hard bluish clay or marl mixed with grains of coarse sand. This compound has taken the place of the woody matter destroyed by maceration, and therefore nothing is left of the original vegetable fragment but the outline of the stems and the impression of the scars of the bark.

The fact of the total disappearance of woody fibres in fossil specimens cannot afford an argument against their reference to land plants; for even in the coal measures, trunks of *Sigillaria*, *Lepidodendron*, etc., are very often recognized in sandstone merely by cylindrical outlines of the trunks, and impressions of the scars of the surface of the bark. This mode of petrification is general for isolated fragments of wood.

As related to the same kind of vegetable we have a fragment, fig. 8, found near Cincinnati, in strata of the Cincinnati group, and which confirms the reference of the specimens discovered by Dr. Scoville both to the locality named, Longstreet Creek, and also to the formation of the Cincinnati group. This specimen at the same time represents more evidently the *Sigillarioid* character by its rhomboidal form, the cicatrices and their position in spiral being still more distinctly seen than in fig. 7, though the piece of bark whose impression is so well preserved has been apparently flattened by compression. No trace of vascular scars is remarked however. These scars are generally erased in specimens whose surface bark has been decomposed and destroyed.

As remarked above, cicatrices of the same character, often without central points, are seen on the surface of the bark of *Artisia*, *Leptophleum rhombicum*, *Sigillaria Brardii*, *S. Defranci*, and other species of the coal.

I have a remarkably fine branch of an *Ulodendron* from the Cannel coal of Pennsylvania, which bears outside cicatrices exactly like those of fig. 7, with oval central vascular scars. The size of this branch is about the same, for it measures twenty centimeters in length, and is only twenty two millimeters broad, though slightly flattened. Its impression into cannel coal is perfectly distinct. Hence the objection against the reference of the specimens of the Silurian to land plant on account of their small size is groundless.

On the reign of organized beings to which these fragments are referable there can be therefore no doubt, for considering merely the size of the stems and their cylindrical form they evidently represent plants.

The question is therefore on the relation of the stems to land or marine plants. Besides the authorities which have been quoted as regarding as evident the relation of these fossil remains to land plants, the analogy of

the characters described and their comparison to those of some vegetable of the coal is evidence of their nature. And though these remains have been found in old formations, wherefrom as yet no trace of land plants had been obtained, the doubt on that score is now removed by the discovery of other plants of the same kind in the Lower Silurian of North America, and still more by that of a Fern in the Lower Silurian of France, the schists of Angers, which seem to be related by synchronism to the Cincinnati Group.*

On the character of this American formation, T. A. Miller remarks, in his Catalogue of American Paleozoic fossils, "that in the Western States of North America, where the Utica Slate is absent from the Hudson River Group, the upper part of the Lower Silurian is generally called the Cincinnati Group. Its strata exposed in Ohio, Indiana and Kentucky, do not exceed one thousand feet in thickness. The lower part is probably the equivalent of the upper part of the Trenton Group. The remainder belongs to the Hudson River Group. The total thickness of its exposure scarcely exceeds one thousand feet.

Some of its characteristic fossils as *Bellerophon bilobatus*, *Strophomena alternata*, *Zygospira modesta*, *Leptena sericea*, *Buthotrephis gracilis*, *Beyrichia chambersi*, *Calymene senaria*, *Isotelus gigas* and *I. megistos*, pass entirely through the Group. *Trinuclerus concentricus*, *Triarthrus becki*, *Orthis multisepta*, *O. emacerata*, *Streptorhynchus hallia*, *Ambonychia bellistriata*, *Modiolopsis cincinnatiensis*, *Cycloconcha mediocardinalis*, *Lichenocrinus crateriformus*, and *Chetetes (?) jamesi*, are confined to the lower half of the group. *Glyptocrinus decadactylus*, *G. dyeri*, *G. nealli*, *G. fornshelli*, *Lichenocrinus tuberculatus*, *Streptorhynchus filitecta*, *S. subtenta*, *S. sulcata*, *S. sinuata*, *S. nutans*, *Orthis insculpta*, *O. subquadrata*, *Rhynchonella capax*, *R. dentata*, *Cypricardites haynesi*, *Anomalodonta gigantea*, *A. alata*, *Anodontopsis milleri*, *Favistella stellata*, *Tetradium fibratum*, and *Streptelasma corniculum*, are found only in the upper part of the group. Some fossils occupy only a few feet in vertical range, as *Orthis insculpta*, *Orthis retrorsa*, *O. emacerata*, *Glyptocrinus nealli*, and *Streptorhynchus suicata*.

This formation is composed in its whole of alternate layers of blue marl and limestone of variable thickness, the limestone layers rarely attaining one foot.

*Since the preparation of this paper, I have received from Rev. H. Hertzner, 15th Oct., 1877, three small specimens distinctly related to the fragments described above by the characters and disposition of the cicatrices of the surface, but greatly different by the form of the bodies. One of them is comparable to our figure 8. It is a little larger, convex on the surface, and seems part of a branch. The two others, both of the same size, resemble gibbous tubercles, or rather small door knobs, four to five centimeters in diameter, with border rounded and the upper surface flat or slightly convex. One of them has in the middle a scar-like depression re-

The schists of *Calymene Tristani*, where the fern mentioned above was recently discovered, have been considered by Dufrenoy as an upper member of the Caradoc sandstone of Great Britain. The Cincinnati Group is generally referred to this formation. Its relation, however, to the schists of Angers is not positively fixed. The preponderance of species of *Calymene* like *C. senaria*; of analogous Genera, *Triarthrus becki*, etc., so common in the blue shale of the Cincinnati epoch, seem to indicate a close relation between both formations of Europe and of America. The enumeration of fossils considered characteristic of the Cincinnati group may afford by comparison more positive evidence of the geological relation of the strata where the first Silurian remains of land plants have been found.

It is a remarkable fact that the character of these Silurian plants, described above, give us like a microcosmical representation of the flora of the Carboniferous, so simple and at the same time so admirable in the multiple subdivisions of its specific forms. The coal flora is a compound mostly of vascular cryptogamous plants: Lycopodiaceæ, Ferns and Equisetaceæ, and of some Phanogamous Gymnosperms whose types are apparently related to the Cycadeæ or to the conifers.

We now have represented in the Silurian,

1st. The *Lycopodiaceæ*, by species of *Psilophitum*; diminutive forms but primitive types of the *Lepidodendrea*, represented in the coal by very large trees distributed in a number of generic and specific divisions.

2d. The Ferns, by a species related to *Paleopteris* or to the group of the *Neuropteridæ* which makes the finest and most common species of the coal. The fern of the schists of Angers is named *Eopteris Andegaversis* by Saporta, who discovered it.

3d. The *Calamariæ*, by *Sphenophyllum* and *Annularia*; these forming two sections related to the *Equisetaceæ*, but whose vegetable affinity is not satisfactorily ascertained. They represent Cryptogamous acrogens like the ferns.

6th. The *Sigillariæ*, placed by some authors as an order of plants between the Conifers and the Cycadeæ, or representatives of the Phænogamous gymnosperm. We have, it seems, a species of this group in the *Protostigma*.

The *Cordaites* now are considered Conifers.

From the preponderance of large fossil trunks of Conifers in the Devo-

sembling the point of attachment of a tuft of leaves. Both are marked around on the borders and upon the top surface by rhomboidal cicatrices in spiral order like those of our figure 7. Some of these especially along the border are deep and have very distinct central mammillæ like points of vascular scars. These organized bodies are attached to broken pieces of Silurian limestone, bearing upon the lower part fragments of small marine mollusks. This, together with their shape, their convex or flattened surface, seems to prevent their reference to *Sigillarioid* plants. They look however like miniature trunks of *Cycadeæ*, which for many of their species

nian one may expect to find remains of the Pine family in older formations. When therefore we get from the Silurians fragments of leaves of *Cordaites* (a probable discovery, for they have been found abundant in the Devonian) we shall have all the essential types of the plants of the Carboniferous flora already represented in the oldest paleozoic times.

A Species of Fungus recently discovered in the shales of the Darlington Coal Bed (Lower Productive Coal Measures, Alleghany River Series) at Cannelton, in Beaver County, Pennsylvania.

BY LEO LESQUEREUX.

(Read before the American Philosophical Society, October 19, 1877.)

The discovery of a *Fungus* in connection with plants of the coal measures is not less remarkable than that of land plants in the Silurian.

Lindley and Hutton, in their Fossil Flora of England, 1831-33, have represented (plate 65 of the first volume) a kidney shaped, round, flattened body, whose outline and surface, marked by zones of alternate density and coloring along the borders, recall somewhat the characters of some of the hard *Fungi* seen upon old trunks of the forests at the present time and known as *Polypores*, *Bolets*, etc., or generally called *Sponge-Mushrooms*. The characters of this fossil organism are so uncertain that the authors themselves, though applying to it the Generic name of *Polyporites*, consider as very doubtful its reference to the vegetable kingdom.

Mr. Bowman, the discoverer to whom the species is dedicated as *P. Bowmani*, remarks, that one of his specimens might be taken for the scale of a fish or of some great Saurian. Since that time no kind of remains referable to *Fungi* has been seen in the coal, except one specimen found in the Anthracite measures near Pottsville, Pa. It is apparently identical with the English species and does not afford any more light upon its nature. This specimen, however, contradicts by its habitat its reference to the animal kingdom, as no remains of this kind are found in the Anthracite measures of Pennsylvania.

But there are in the Tertiary Lignitic of the Rocky Mountains some clay beds associated with coal, wherein are intercalated shaly fragments, colored

have, at our epoch, globular or button-like stems impressed with cicatrices of leaves, and sometimes flattened and depressed at the top toward the central axis, where the tuft of leaves is coming out. If, therefore, such analogy could be admitted, these specimens would confirm the opinion advanced in considering the probable reference of the branches inscribed above. But this suggestion is too hazardous in its application to remains found in connection with Silurian limestone. For after all, these remarkable fragments may altogether represent one of those organisms like *Uphan-tænia*, *Dictyophytum*, etc., whose nature seems to partake of the character of land and marine vegetables, and whose relation is still unknown.